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#### A BIOCOENOSE OF PAPYRUS HEADS (*Cyperus papyrus*)

Papyrus (*Cyperus papyrus*) is of historical interest because it was used by the ancient Egyptians, Greeks, and Romans in making their writing parchments and has given us the word paper. Paper pulp is still obtained from papyrus and recently (S. and E. African Yearbook, p. 704) it was estimated that enough of the sedge existed at the mouth of the Umfolosi River, Zululand, to produce 100,000 tons of pulp annually.

Papyrus is widespread in Africa and occurs in several nearby regions (as Sicily and Palestine). Stretching along the upper White Nile River for roughly 250 miles, and extending laterally in places 200 miles, is a vast papyrus swamp called the Sudd which occupies an area of possibly 50,000 square miles. It lies entirely in the Anglo-Egyptian Sudan west of Central

Abyssinia. The Sudd is probably one of the largest areas in the entire world dominated by a single sedge. In it papyrus forms a dense growth 8 to 15 feet high floating on the water or mud. Large rafts often break loose and float downstream or drift with the wind. Not only is navigation impeded or temporarily stopped but the evaporation from the swamp is so large as to materially lower the river level. The Sudd is treated by the Egyptians of lower Egypt as a vital problem since they depend upon the combined White and Blue Nile for their entire water supply. They keep a staff of men continually at work cutting drainage canals and attempting to keep these open. At the same time the swamp acts as a huge sponge to hold back the flow of water during the rains and to release it gradually during the dry sea-

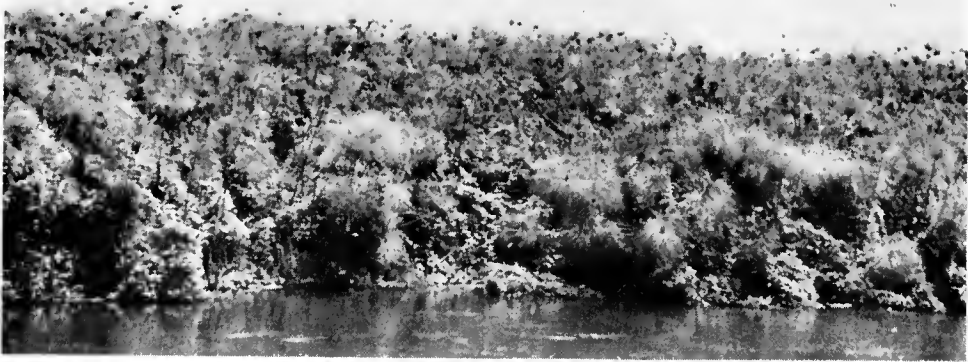


FIG. 1. The Sudd, Upper White Nile River, Anglo-Egyptian Sudan, showing papyrus heads eaten by migratory locusts.

son. Probably in large part because of the Sudd, the White Nile, although much longer, furnishes less water to Egypt than the shorter Blue Nile from the mountains of Abyssinia.

It is the purpose of this note to call attention to the biocoenose centering about the heads of papyrus in the Sudd. The association is not only scientifically worth investigating but has economic implications because of the use of papyrus in paper-making and water conservation.

On the stems, which may be ten or more feet long, papyrus heads of two kinds are borne. One consists of flower spikelets on long stalks borne in an umbel about two feet in diameter. The other consists of an apparently sterile inflorescence of similar size. In the Sudd papyrus grows so densely that the heads touch one another. As one passes by small steamboat through the Sudd for days the view is a vista endless to the horizon on every side of papyrus heads undulating with the breeze like a field of grain.

Insects and spiders in this region would be forced to nest on these floating rafts since no soil is exposed over large areas. The bases of the papyrus heads, where the numerous spikelets come together to form a dense mass one or two inches thick, offers a suitable nesting place for some.

While passing by steamboat through the Sudd, July 8 to 11, 1939, I was interested in the ants brushed off from papyrus as the boat barged into the vegetation in the sharp, narrow turns and also collected spiders and other arthropods found. The ants have been determined about

as far as possible without the benefit of identified material in European collections which is now unavailable. The spiders and many other arthropods apparently are unidentifiable in this country.

The arthropod of most conspicuous importance in the biocoenose is the migratory locust (probably *Cyrtacanthacrus septemfaciata*). The enormous swarms cover many square miles and migrate for hundreds of miles. "A swarm that passed over the Red Sea in 1889 was estimated to weigh 42,850,000,000 tons and covered 2,000 square miles. Actual expenditures in South Africa for locust control in 1935 were 949,681 pounds sterling and the 1933-4 loss of crops through them over Africa was estimated at 7,000,000 pounds sterling (S. and E. African Yearbook, p. 796). While passing through the Sudd a continuous cloud of locusts passed over us July 8 from 9 to 11 A.M., their feces showering down on the boat and water like rain. The feces were of very coarse fiber, undoubtedly from papyrus, and were pale green and quite dry. During this day and on several others, especially July 5, large clouds of locusts like dense smoke were seen; several times the clouds covered a quarter or more of the horizon. The boat passed for miles through papyrus banks with the distal parts of the flower spikelets eaten down. Flocks of snowy egrets and a plain-colored brown hawk preyed on the locusts, the hawk leisurely flying through a swarm and now and then reaching out with a foot to capture one.

The following orders were taken while passing through the Sudd:

ORTHOPTERA—Tettigonioids flying to lights.

HEMIPTERA—Aquatic Hemiptera flying to lights.

NEUROPTERA—Neuroptera were found about lights and on the screens in the morning.

TRICHOPTERA—Great annoyance in the evenings, particularly during rains, the smaller species coming through the screens to lights, the larger species covering patches of the screens.

LEPIDOPTERA—Moths flying to lights.

DIPTERA—Chironomoids, culicoids, tabanids and muscoid flies. Mosquitoes were very troublesome at times, especially when the boat brushed against the papyrus. Tabanids (including *Tabanus tacniola* P. de B., det. Bequaert) were taken on several days, *T. tacniola* also being taken with *T. latipes* Mac. and *T. fasciatus* v. *niloticus* Aust. (det. Bequaert) downstream at Kaka July 6. A curious stalk-eyed fly (Diopsidae) was in my cabin early on July 10 morning.

COLEOPTERA—Staphylinoid, coccinelloid, elateroid and other beetles were in papyrus heads. Members of several families were small and ferruginous like the ants and spiders. At night the Sudd was illuminated at times by swarms of brilliant fireflies.

HYMENOPTERA—Parasitic Hymenoptera came through the screens to light at night and a sphecid wasp was taken at noon. The ants are listed below.

ARACHNIDA—Spiders were common inhabitants of the papyrus. Most of the spiders were pale and of medium size. Two species, however, resembled the commonest species of ants, the *Crematogaster*, *Pheidole* and *Camponotus* (*Myrmotremma*), in size, color and body shape, the latter being constricted into ant-like divisions. Such examples have often been interpreted as examples of mimicry but positive evidence is usually lacking.

#### ANTS

Eight species of ants were taken from the steamboat after brushing against papyrus. Five of the species were taken from the heads of papyrus, two were brushed off the plant and one was taken only in the winged female caste. The only nesting sites available for them were the base of the papyrus heads, the stems (of which none examined had cavities), or nests such as carton nests attached to the plant. Four species were small and pale ferruginous in color, blending in well with the papyrus; one was medium sized and brown, blending also well; three species were small and black, though appearing inconspicuous in nature.

In addition to the ants from papyrus there were colonies of three other species which were living on this boat (Weber, '40).



FIG. 2. Cloud of migratory locusts passing over the Sudd, Upper White Nile River, Anglo-Egyptian Sudan, as seen from a steamboat. Birds are cattle egrets.



FIG. 3. Cloud of migratory locusts migrating over the Sudd, Upper White Nile River, Anglo-Egyptian Sudan. The birds are the common cattle egret.

*Pheidole megacephala* (Fabr.), ssp.

Numerous workers and soldiers of this species were taken July 9 and 10, and on the 13th, the day following our emergence from the Sudd. The species appear to be one of the commonest here and is of such a small size as to easily find nesting space in small masses of vegetation. Workers were taken from the front of the boat after encountering floating papyrus and were found in the papyrus heads themselves. The workers are of a bright ferruginous in color and the soldiers darker. Because of their size and color they blend well with the vegetation as seen by the human eye.

*P. megacephala* is a common tropicopolitan species and a dozen forms from Africa are described. The ants nest usually in the soil. The Sudd form resembles the subspecies *punctulata* somewhat but is smaller and darker; it is darker than the typical form.

*Crematogaster* (C.) *menileki* Forel, ssp.

Numerous workers were taken on every day except the first during our passage and on the following day below stream from the village of Bor when we brushed against more papyrus and grass. This ant is doubtless one of the commonest and most widespread ants in the Sudd. A winged female was found in the bathroom in the evening, July 10. Workers were often found on heads of papyrus as well as on the boat after brushing this plant.

The Sudd form of this species is the third known to live in the crowns of papyrus. Santschi (Wheeler, '22, pp. 154-5) has described *C. menileki proserpina* and *C. menileki proserpina pluton* from nests found in papyrus in

the Belgian Congo, the former at Malela, the latter at Zambi. They formed carton nests, as do *Crematogaster* species in general, and *proserpina* was reported to sting furiously, as is the habit of workers of this aboreal genus. The Sudd form is close to one I found on the east lower slopes of the Imatong Mts., Sudan, but is paler and with much more reduced epinotal spines than any of the described forms. The color of the Sudd form is uniformly pale ferruginous, a color blending well with papyrus to the human eye.

*Leptothorax* (*Goniothorax*) *angulatus* Mayr

A single alate female was found at the base of a papyrus head July 10 in the afternoon. Another female, though dealate, was taken from papyrus at 7:30 the same morning. Between 7:30 and 10 p.m. July 8 a male *Leptothorax*, probably of this species, came through the screen of my cabin to the light. The female is a pale ferruginous in color with the thorax and gaster slightly infuscated as is customary in female ants. Workers of this species in my collection from Victoria Falls, S. Rhodesia (Arnold), are even paler and more uniformly ferruginous. This color is common in *Leptothorax* (e.g. *echinatinodis* of S. America, *curvispinosus* of N. America). The species was originally described from the Sinai Peninsula, Egypt and has been recorded from Tunis and East Africa.

*Niphomyrmer* sp.

This species was taken only in the alate female caste, the ants coming through the screen of my cabin to light July 8 between 7:30 and 10 p.m. They are uniformly ferruginous in

color, being much paler than most of the African species. Most of the species of this genus in Africa are found in humid West Africa though several are known from East and South Africa.

*Cataulacus pygmaeus* E. André, ssp.

Workers and an alate female of this species were found July 10 with *Acantholepis*, *Pheidole* and spiders at the base of the papyrus heads where the flower spikelets left the stem. The numerous spikelets here formed a mass between one and two inches thick which was easily dense enough for nesting purposes.

This ant has retained the black color with ferruginous legs of the species. The size is distinctly smaller than another subspecies which I took in the Imatong Mts., Sudan, and the subspecies *lujac* Forel. *C. pygmaeus* was originally described from Sierra Leone and it or its forms have since been recorded from widely spread African localities.

*Acantholepis capensis simplex* Forel

Numerous workers were taken July 10 and 12 from papyrus and after leaving the Sudd July 13 when the boat brushed against papyrus and grass. The ants are small and black.

The subspecies *simplex* was originally described from Somaliland and since reported from widely scattered East and South African localities. I found it at 6000-6200 ft. in the Imatong Mts., Sudan. The numerous forms of *capensis* including *simplex* are recorded as nesting only in soil except for the subspecies *issore* which I found in the Imatongs nesting in *Acacia* twigs.

*Camponotus (Myrmoturba) maculatus* (Fabr.)

This species was taken July 10. The media workers which were found were similar in all details to those taken in a variety of habitats. The color is basal yellowish brown with infuscated head and patches on the thorax and gaster. The workers appear to belong to the typical form of the species which was originally described from Sierra Leone. Numerous subspecies and varieties have been described from all over Africa and much of the rest of the world. The paler subspecies *aegyptiacus* Emery which would seem to blend in well with papyrus is an inhabitant of dryer parts of the Sudan and was taken north of the Sudd (Khartoum, Ed Dueim, Er Renk) and to the south in the Imatong Mts.

*Camponotus (Myrmotrcma) sp. nr. galla and perrisi* Forel

This is a black species with upright yellowish hairs and shining yellow appressed pubescence on the gaster. It seemed one of the commonest ants and was taken several times on July 10 and 12 and below the village of Bor. The workers were taken in papyrus heads as well as from the boat. The ants are comparatively small for *Camponotus* and would not require a large nest.

SUMMARY

Papyrus (*Cyperus papyrus*) covers an area called the Sudd, extending in places 200 miles or more in width along the upper White Nile River in the Anglo-Egyptian Sudan west of Central Abyssinia. This sedge grows eight to fifteen feet high and terminates in large heads about two feet in diameter composed of flower spikelets.

A biocoenose centers about the papyrus heads and consists of at least eight species of ants and species of other orders of Arthropoda, chiefly Orthoptera, Coleoptera, parasitic Hymenoptera and Arachnida. Four of the ant species and several species of beetles and spiders resembled each other in size, general body shape and color, the color being a reddish ferruginous blending in well with papyrus to the human eye. The resemblance between two species of spiders and three ant species in body shape was marked.

The biocoenose would be worthy of study because of the historical, economic and scientific interest in papyrus.

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